

## **Remarks**

### ***I. Status of the Claims***

Claims 1-20 were pending under examination in this application. Claims 1 and 17-20 have been amended herewith to further clarify the subject matter being claimed and to comply with a claim construction acceptable in U.S. practice. Claim 2 has been cancelled. No new matter or new issue is introduced by the claim amendments. By this amendment, Claims 1, 3-20 are pending under consideration in this application. Applicants submit the below remarks, and respectfully request reconsideration and allowance of the pending claims.

### ***II. Information Disclosure Statement***

The Office Action indicates that the Information Disclosure Statement filed December 27, 2004 fails to comply with 37 C.F.R. § 1.98(a)(2). It was Applicants' understanding that the references themselves had already been forwarded to the Examiner by the PCT International Bureau. Therefore, Applicants are submitting the requested non-patent literature references with this Response along with the prior submitted Information Disclosure Statement and another copy of the 1449 form for the Examiner's signature. No fees are believed due, however, the Commissioner is hereby authorized to charge Deposit Account No. 19-5029 for any fees due.

### ***III. Specification/Figures***

In the specification, paragraph [0010] (page 3, lines 6-10 of the original application) has been amended to correct the discrepancy with the original Claim 3, as the Examiner suggested. The original Claim 3 recites that "X represents a mixture of Cu<sup>2+</sup>, Cu<sup>+</sup>, O<sup>2-</sup>, OH<sup>-</sup>, F<sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup> and/or I<sup>-</sup>." The omission of "I" in the paragraph [0010] of the specification was a typographical error and the paragraph [0010] of the specification has been amended to include "I." No new matter has been introduced by this amendment to the paragraph [0010] because the inclusion of "I" is supported by the original Claim 3.

The Examiner objected to the disclosure because the specification only teaches the preferred definitions of M, A and X. The Examiner asserted that there is no teaching of any other definitions of these variables.

Applicants respectfully submit that the specification teaches that "M and A are different individual chemical elements or mixtures of elements appropriate to form the apatite structure," (p.2, ll. 17-19) and "X represents different atoms in different quantity, situated in the hexagonal channels. Essential feature of the compounds is the presence of Cu, in particular, of Cu ions in the channels." (p.2, ll. 22-25) The preferred definitions of M and A are defined in the specification, (p.2, ll. 21-22) ("A represents P, V or mixture thereof and M represents Ba, Sr, Ca or a mixtures thereof) and the preferred definition of X is defined in the specification, (p.3, ll. 8-10) ("X represents a certain fraction of  $\text{Cu}^{2+}$ , and/or  $\text{Cu}^+$ , and  $\text{O}^{2-}$  ions mixed with anions such as  $\text{OH}^-$ ,  $\text{F}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ). Examples 1-10 disclose the various compounds of the invention teaching the different embodiments of general formula (I), in which the general formula (I),  $\text{M}_5(\text{AO}_3)_3\text{X}$ , form an apatite structure and X is situated in the hexagonal channels of the apatite structure including Cu atoms.

Accordingly, Applicants respectfully request that objections to the specification be withdrawn.

### ***III. Claim Rejections under 35 U.S.C. § 101***

Claim 18 is rejected under 35 U.S.C. §101 because of the claimed recitation of a use, without setting forth any steps involved in the process, resulting in an improper definition of a process, *i.e.*, resulting in a claim which is not a proper process claim under 35 U.S.C. § 101. Applicants have amended Claim 18 to conform with the U.S. practice and respectfully request that this rejection be withdrawn.

### ***IV. Claim Rejections under 35 U.S.C. § 112, First Paragraph***

The Examiner has rejected Claim 3 under 35 U.S.C. 112, first paragraph as containing subject matter which was not described in the specification in such a way as to reasonably convey

to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification has been amended to be commensurate with the claim and the rejection is moot.

***V. Claim Rejections under 35 U.S.C. §112, Second Paragraph***

The Examiner has rejected Claims 1-20 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants respectfully traverse the rejection.

In particular, Claim 18 has been rejected because Claim 18 does not set forth any steps involved in the method/process and the Examiner asserted that it is unclear what method/process applicant is intending to encompass. Applicants amendment to Claim 18 renders the rejection moot.

Claims 17, 19 and 20 have been rejected because of improper dependency to Claims 15, 10 and 15, respectively. Applicants amended Claims 17, 19 and 20 in order to correct the improper dependency, rendering the rejection moot.

Claims 1 and 3-20 have been rejected because of being indefinite since the variable M is not defined. Applicants amended Claim 1 to specify the variable M, rendering the rejection moot. Claims 3-20 depend on Claim 1.

Claims 1, 3-8 and 10-20 have been rejected as indefinite since the variable A is not defined. Applicants amended Claim 1 to specify the variable A, rendering the rejection moot. Claims 3-20 depend on Claim 1.

Claims 1, 2 and 9-20 have been rejected as indefinite since the variable X is not defined. X is already defined in Claim 1 such that "X includes Cu-atoms." Claim 2 has been cancelled and Claims 9-20 depend on Claim 1. Therefore, the rejection should be withdrawn.

Claim 3 has been rejected as indefinite since it states both "and/or" and "a mixture." Applicants have amended Claim 3, rendering the rejection moot.

Accordingly, Applicants respectfully request withdrawal of this rejection.

***VI. Claim Rejections under 35 U.S.C. § 102***

The Examiner has rejected Claims 1-13, 16, 17, and 19 under 35 U.S.C. § 102(b), as being anticipated by U.S. Patent No. 2,664,401. The Examiner asserted that the reference teaches producing a copper containing calcium phosphate apatite by mixing calcium carbonate, di-ammonium hydrogen phosphate and  $\text{CuSO}_4$ , thermally treating the mixture in air at 1000 °C for 30 minutes, grinding the heated mixture and then heating the ground product at 1150 °C for 30 minutes in a steam atmosphere, which is an air atmosphere. According to the Examiner, this is the process of claims 10-13 and the resulting compound reads upon the compound and pigments of claims 1-9, 16, 17 and 19. The Examiner further asserted that the reference teaches the claimed process, compound and pigment. Applicants respectfully traverse the rejection.

Applicants' invention recites "a compound having the general formula (I),  $\text{M}_5(\text{AO}_4)_3\text{X}$ ," wherein the group  $\text{M}_5(\text{AO}_4)_3$  forms an apatite structure and X is situated in the hexagonal channels of the apatite structure and includes Cu-atoms. In the compounds of Applicants' invention, it is necessary that X, in particular Cu ion, is incorporated in the hexagonal channels.

The cited reference, U.S. Pat. No. 2,664,401, does not teach or suggest every limitation of the claimed subject matter of Applicants' invention. The U.S. Pat. No. 2,664,401 discloses in Claim 1 a luminescent composition having a matrix of apatite type crystalline structure of the group consisting of  $3\text{M}_3(\text{PO}_4)_2 \cdot \text{M}(\text{OH})_2$  and  $3\text{M}_3(\text{PO}_4)_3 \cdot \text{MO}$ , in which M is an alkaline earth metal and an activator of the group consisting of one or the metals copper, antimony, tin and thallium and mixture thereof. The U.S. Pat. No. 2,664,401 also discloses a method of manufacturing luminescent materials comprising the steps of heating to a temperature in the range of about 900-1200 °C, in an atmosphere comprising steam, a mixture of an activator of the group consisting of one of the metals copper, antimony, tin and thallium and mixture thereof.

Contrary to Applicants' invention, in U.S. Patent No. 2,664,401, the copper, or another activator are exclusively substituted on the M position of the formula and the copper is not located in the channels. In Applicants' invention, copper is not substituted for the alkaline earth metal M and X can be varied by the additional insertion and/or exchange of OH.

Therefore, the cited reference does not teach or suggest that X including copper atoms is situated in the hexagonal channels of the apatite structure, as recited in Applicants' claimed invention. Accordingly Claim 1 of Applicant's invention is not anticipated by the cited reference.

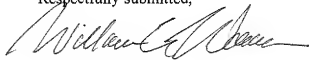
Accordingly, Applicants respectfully request withdrawal of this rejection.

#### **VII. Conclusion**

The foregoing is submitted as a full and complete response to the Office Action mailed January 11, 2007.

Please charge any additional fees, or credit any overpayment, to Deposit Account 19-5029 (Ref.: 18744-0028). If there are any issues that can be resolved by a telephone conference or an Examiner's amendment, the Examiner is invited to call the undersigned attorney at (404) 853-8081.

Respectfully submitted,



William L. Warren  
Reg. No. 36,714

SUTHERLAND ASBILL & BRENNAN LLP  
999 Peachtree Street, NE  
Atlanta, Georgia 30309-3996  
(404) 853-8000  
Our Docket: 18744-0028